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Governor

FREDERICK A. BRUNNER
Director



STATE OF MISSOURI
DEPARTMENT OF NATURAL RESOURCES

DIVISION OF ENVIRONMENTAL QUALITY

P.O. Box 176
Jefferson City, MO 65102

Division of Energy
Division of Environmental Quality
Division of Geology and Land Survey
Division of Management Services
Division of Parks, Recreation,
and Historic Preservation

October 9, 1987

Site: West Lake, MO
ID # MBD07990932
Break: 17.8
Other: 10-9-87

Mr. William E. Whitaker, President
West Lake Landfill, Inc.
13570 St. Charles Rock Road
Bridgeton, MO 63042

Dear Mr. Whitaker:

RE: Hydrogeologic Investigation, West Lake Landfill, Primary Phase Report,
Received November 4, 1986.

The Waste Management Program (WMP) has reviewed the above referenced report which was submitted to satisfy condition #3 of the Solid Waste Disposal Area Operating Permit Number 118912. The WMP offers the following comments and recommendations for execution of the secondary phase of this investigation.

1. Maximum Groundwater Level and Leachate Generation.

The primary phase report discusses the relationship between stages of the Missouri River and the water levels in on-site monitoring wells. However, this report does not address the impact of worst case conditions, such as a major flood on water levels or leachate generation.

To assure current assumptions on groundwater levels are accurate, the WMP recommends that the water level in three (3) selected indicator wells be continued as part of the long term monitoring program for this site. It is recommended these water level measurement activities be coordinated with future high river periods, in addition to quarterly monitoring, to confirm the landfill will be unaffected by rising river elevations.

2. Precipitation and Leachate Generation.

During technical discussions of the hydrogeological study, it was reported that infiltration resulting from local precipitation will have the greatest impact on leachate generation rates. To better define the leachate characteristic trends of the site and potential impacts on the alluvial aquifer, it is recommended future monitoring results be correlated with general precipitation data to determine if weather related impacts are significant.

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SUPERFUND RECORDS

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Providing a good infiltration history on the site will require consideration of the rainfall intensity and resulting runoff rate, as well as drainage problems which could increase infiltration in localized areas. Since any increase in leachate generation resulting from a storm event would be a delayed response, daily entries to this type of record would not necessarily be recommended. Instead, general comments of weather conditions during the months preceding sampling, with dates of major storm events, and monthly precipitation totals for the site or nearby weather reporting station would appear sufficient to estimate weather related trends.

It is also recommended future short term monitoring, proposed as part of this study, be performed during a relatively high infiltration period to initiate this data collection process.

3. Leachate Production Impacts.

The WMP recommends that the potential effects of leachate generation on the water quality of the alluvial aquifer be considered, especially with regard to future off-site uses of the alluvial aquifer. Calculations developed in estimating the potential dilution potential of the alluvial aquifer should be included.

4. Possible Interconnection of Limestone and Alluvial Aquifers.

Most of the discussion in the primary phase report pertains to the alluvial aquifer. The WMP suspects that a hydraulic connection between the limestone aquifer and alluvial aquifer may exist. One reason for this is that Mississippian limestones, such as the types that comprise the valley walls, are frequently solution weathered. The fact that grouting was necessary in the quarry area to block water inflow suggests that the limestone is at least somewhat solution weathered. Figures III-1, 4, 6 and 7 suggest groundwater may be migrating from the alluvial aquifer into the limestone, perhaps as a result of pumping in the quarry.

The WMP believes that better definition of the limestone aquifer is necessary to predict the likely direction of flow of pollutants from the quarry area in the event that pumping in the quarry ceases. Please document the points made in the August 20, 1987 meeting regarding the scarcity of water along the soil bedrock contact and the rates of inflow into the quarry.

Three (3) groundwater monitoring wells were installed in the area of the grout curtain in the northeast corner of the large quarry. Permit condition 7.B. of Permit Number 118912 requires that the water level in these wells be monitored monthly and be recorded. Please examine the water level data which has been collected from these wells and discuss any relationships between water levels in the alluvial aquifer and with river stages.

Future Groundwater Monitoring.

A. Upgradient Wells.

Page V-8 of the engineering report notes that monitoring well D-89 may not always be upgradient and recommends that a shallow monitoring well be installed close by. The WMP agrees that a shallow well in the vicinity of D-89 may be suitable for collecting background groundwater samples. The WMP believes that insufficient data is available to state conclusively that a shallow well near D-89 will be suitable for collecting background groundwater samples during all seasons. The WMP recommends that wells S-80 or I-50 and D-91 also be monitored for background water quality.

B. Short Term Monitoring.

The sampling which has been conducted as part of the primary phase is considered to be a good start on a comprehensive monitoring program; however, the study data is limited and cannot be considered indicative of the worst leachate conditions possible from the landfill. The WMP recommends modification of the short term groundwater monitoring program recommended on page V-9 of the primary phase report be made as follows:

<u>Wells</u>	<u>Parameters to be Sampled</u>
D-90	Priority Pollutants
D-89	Priority Pollutants
D-81	Priority Pollutants
D-93	Priority Pollutants, Radiation
D-83	Priority Pollutants, Radiation
D-94	Priority Pollutants, Radiation
D-92	Priority Pollutants, Radiation
S-84	Priority Pollutants, Radiation
I-56	Priority Pollutants
I-66	Priority Pollutants, Radiation

C. Long Term Monitoring.

The WMP believes that the long term monitoring plan on page V-10 of the report should be implemented with the following additions:

1. Additional Parameters

<u>Wells</u>	<u>Parameters to be Sampled</u>
I-59	Priority Pollutants, Radiation, Solid Waste Parameters
D-83	Priority Pollutants, Radiation, Solid Waste Parameters
D-85	Priority Pollutants, Radiation, Solid Waste Parameters
D-81	Priority Pollutants, Radiation, Solid Waste Parameters

Mr. William E. Whitaker
October 9, 1987
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2. Additional Locations for Monitoring Standard Solid Waste Parameters

The proposed monitoring on the north side of the landfill includes three (3) deep wells and one (1) shallow well. The WMP believes that at least two (2) additional sampling points from shallow or intermediate levels be included, perhaps wells I-66 and I-62. These sampling points should be monitored for the standard solid waste parameters.

Between monitoring wells S-82 and D-89 are more than 2000 feet of landfill boundary for which no monitoring is proposed. The WMP recommends that at least two (2) additional monitoring points in the vicinity of well S-54 be included. Well D-81 should be one of the wells included in the sampling program. At least one shallow or intermediate well should complement well D-81. Sampling should be for the standard solid waste parameters.

If you have any questions, feel free to contact Mr. Thomas Gredell of the Waste Management Program at (314) 751-3176.

Sincerely,

DIVISION OF ENVIRONMENTAL QUALITY



Nicholas A. Di Pasquale
Director
Waste Management Program

NAD:jkl

cc: Mr. Robert M. Robinson, P.E., Burns & McDonnell

bcc: Division of Geology and Land Survey
St. Louis Regional Office
Bill Weis, Superfund Section, WMP
Tom Gredell, Solid Waste Section, WMP
Jon Kraft, Solid Waste Section, WMP

Burns & McDonnell
ENGINEERS - ARCHITECTS - CONSULTANTS

January 4, 1988

Mr. Thomas Gredell, P.E.
Chief, Solid Waste Permit Section
Waste Management Program
Missouri Department of Natural Resources
P. O. Box 175
Jefferson City MO 65102

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JAN 5 1988

West Lake Landfill
Hydrogeologic Investigation
Project No. 84-075-4-004

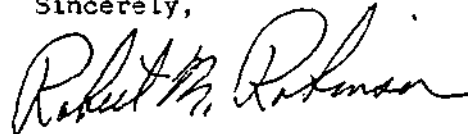
WASTE MANAGEMENT
PROGRAM

Dear Mr. Gredell:

Please find enclosed our letter of January 4, 1988 addressed to Mr. William E. Whitaker, President, West Lake Landfill, Inc. regarding MDNR letter of October 9, 1987 concerning the hydrogeologic investigation. Mr. Whitaker has requested that we transmit our letter to you for the purpose of satisfying Condition #3 in the West Lake Sanitary Landfill Permit #118912. West Lake Landfill, Inc. has reviewed our letter and is in concurrence with implementing the short-term and long-term monitoring programs as we have suggested.

We would like to reach an agreement with the Waste Management Program regarding installation of the two additional monitoring wells and the short-term monitoring program within the next 30 days so construction and sampling can be scheduled during the next six months.

Sincerely,



Robert M. Robinson, P.E.
Project Manager

RMR/skb618

Enclosure

cc: Mr. William E. Whitaker

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Burns & McDonnell
ENGINEERS - ARCHITECTS - CONSULTANTS



January 4, 1988

Mr. William E. Whitaker, President
West Lake Landfill, Inc.
12976 St. Charles Rock Road
Bridgeton MO 63044

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JAN 5 1988

WASTE MANAGEMENT
PROGRAM

MDNR Letter of 10/9/87
Project No. 84-075-4-004

Dear Mr. Whitaker:

The purpose of this letter is to respond to the Missouri Department of Natural Resources (MDNR) letter of October 9, 1987 regarding the Primary Phase Report on the Hydrogeologic Investigation, West Lake Landfill. Each of their numbered comments are provided with a response.

1. Maximum Groundwater Level and Leachate Generation

As discussed in our meeting with MDNR on August 20, 1987, the groundwater and river flood stage conditions discussed in the report represent a close approximation to the worst case conditions. Figure III-2 shows how the high river stage during 1984 effected the water level in the piezometers. The water table rises and falls with the river stage, but to a much smaller degree, particularly at the great distance from the river at which the site occurs. This is illustrated on Figure I-1 of the report, where a rise in river stage of 13 feet coincides with a change in water table elevation of only 5 feet. Thus, a rise in river stage from the high stage shown on Figure I-1 up to the flood stage will result in only a minor water table elevation change beneath the site.

Burns & McDonnell concurs that water level measurements should be carried out with each sampling round, so that an evaluation may be made of any effect of rising river elevations on the landfill. Instead of selecting three indicator wells, we recommend that water level measurements be made in all wells which are sampled. In addition, river stage data for the sampling period should also be obtained from the Corps of Engineers. Water level measurements will be made in 3 shallow and 3 deep piezometers if the Missouri River Stage exceeds elevation 445.

2. Precipitation and Leachate Generation

Burns & McDonnell concurs that a correlation may be attempted between precipitation and leachate generation. This would be done by planning sampling events during both rainy and dry periods. In addition, climatological data for the area (from Lambert Field, for

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Mr. William E. Whitaker, President
January 4, 1988

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example) could be obtained to document the weather conditions during the sampling period. Because of the relatively low velocities of groundwater flow in the alluvium compared to the duration of rainfall events, we anticipate that no close correlation will be found, and the rate of leachate generation will be relatively constant.

Burns & McDonnell concurs that the short term sampling event will be planned for a few weeks after a relatively high infiltration period. We would expect such an event to occur during the spring of 1988.

3. Leachate Production Impacts

The potential effects of leachate generation on the water quality of the alluvial aquifer are illustrated by the chemical analyses of the numerous water samples obtained to date. This data, combined with the expanded scope of sampling and testing to be carried out in the future (See "Future Groundwater Monitoring," below) has determined and will confirm the actual (not potential) effects of leachate generation on water quality.

Calculations which are pertinent to this discussion and which were raised at the August 20 meeting are as follows:

- a. A sixty-acre site, into which six inches of infiltration occurs per year would generate approximately 10 million gallons of leachate per year.
- b. In contrast, the water table fluctuates approximately six to seven feet, twice throughout an annual cycle of rise and fall of river stage. Assuming a porosity of 35%, this represents an inflow and outflow of approximately 46 million gallons, twice per year, or 92 million gallons per year.
- c. In addition, the underflow in the aquifer, as reported in the Primary Phase Report is approximately 400,000 gallons per day, or about 146 million gallons per year.
- d. Further dilution occurs from infiltration through ditches, ponds, and the ground surface as the groundwater flow away from the landfill. The road ditches along St. Charles Rock Road do not freely drain, but discharge to the groundwater. These ditches and ponds adjacent to the road may infiltrate 40 to 50 million gallons per year.

4. Possible Interconnection of Limestone and Alluvial Aquifer

Attached are water level records from three monitoring wells adjacent to the northeast corner of the quarry. The water levels in these closely spaced wells are seen to occur at widely differing elevations, illustrating that hydraulic interconnections within the limestone itself are poor.

Mr. William E. Whitaker, President
January 4, 1988

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There are no measurements available for water inflow to the quarry. The scarcity of water along the soil bedrock contact is based on observing any seeps or wet surfaces on the exposed quarry walls.

The elevation of the water table within the alluvial aquifer is approximately 430 to 435, while the water levels in the monitoring wells screened in the bedrock adjacent to the northeast corner of the quarry are at elevations in the range of 290 to 364. This large difference in water elevations over a short lateral distance indicates a very poor hydraulic connection between the aquifer and the bedrock. We don't see any relationship between water levels in the alluvial aquifer and the three groundwater wells in the bedrock. We would expect the wells to respond to infiltration through the loess soil overburden.

FUTURE GROUNDWATER MONITORING

A. UPGRADIENT WELLS

We recommend that a decision on including Wells S-80 and D-91 as background wells in the long term monitoring program be delayed until the shallow monitoring well is drilled near D-89 and water level measurements taken.

B. SHORT TERM MONITORING

The WMP has essentially recommended another sampling round for priority pollutants. This may be reasonable if we can agree on what WMP considers the worst leachate condition. We suggest the short term monitoring program be implemented following a wet weather period and the river level has been falling for several weeks.

We believe Well I-56 is not suitable for collection of chemical samples. We recommend that a new shallow well be installed along Old St. Charles Rock Road near I-56. This new well would be sampled for priority pollutants.

Our recommendation is that the Department of Energy sample and analyze for radiation. In view of the fact that the Department of Energy has not been responsive to West Lake's request for a copy of the recommended remedial plan for the radioactive waste at the site, we suggest that the Missouri Department of Natural Resources request the Department of Energy do the radiation monitoring and make their remedial plan available.

C. LONG TERM MONITORING

1. The decision on long term monitoring for priority pollutants should be delayed until the short term monitoring program for priority pollutants is done and evaluated. Certainly quarterly monitoring for priority pollutants seems unreasonable even if the next round of samples indicate a need to monitor.

Mr. William E. Whitaker, President
January 4, 1988

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Any radiation sampling should be the responsibility of the
U.S. Department of Energy.

2. In response to the WMP's request for additional monitoring locations for solid waste parameters, we recommend adding Well I-66 and I-52 on the north side of the landfill and D-81 plus the recommended new shallow well near I-56 (See Item B above). This increases the downgradient wells from 7 to 11.

If you have any questions regarding our suggestions and recommendation, please advise. Transmittal of this letter to MDNR should satisfy Condition #3 in the West Lake Sanitary Landfill Permit #118912. At this time the monitoring does not indicate any remedial action is necessary. The south portion of the landfill was final covered and vegetated during 1987. The current demolition landfill is improving surface drainage and should result in a significant reduction of infiltration when final covered, graded and seeded. We recommend that West Lake Landfill, Inc. continue to seek a decision from the U.S. Department of Energy regarding what action they are recommending for the area west of the current demolition landfill. If the Department of Energy plans to leave the radioactive waste in place, then we recommend that West Lake submit an application to MDNR for operating a demolition landfill over the area so surface drainage conditions can be improved.

Sincerely,

Bill Shefchik

William Shefchik
Geologist

Robert M. Robinson

Robert M. Robinson, P.E.
Project Manager

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